between the overlapping portions. The pair of overlapping wires and the solder before being melted are called a pre-connection wire **20**A.

[0101] In addition, in FIG. **4**A, for ease of understanding, a gap is formed between the vertical wall of the wire accommodation groove **7***a* and the side surface of the wire. However, since the width of the groove and the width of the wire are substantially the same, such a gap is not formed.

[0102] Next, as shown in FIG. **4**B, the first rods **2**A and the pressing plate **5** are lowered by the first air cylinder **2** such that the pressing plate **5** overlaps the holding base **7**. In this state, the upper surface of the pre-connection wire **20**A is pressed by the protrusion **5***a* of the pressing plate **5**, and thereby preventing misalignment between the wires of the pre-connection wire **20**A (see FIG. **3**).

[0103] Next, as shown in FIG. **4**C, the second rods **3**A and the heating body **4** are lowered by the second air cylinder **3** such that the lower surface **4***a* of the heating body **4** and the upper surface **5***b* of the pressing plate **5** come into contact with each other. Accordingly, heat of the heating body **4** is transferred to the pressing plate **5** and is further transferred to the pre-connection wire **20**A from the protrusion **5***a* of the pressing plate **5** so as to melt the solder.

[0104] When the solder is melted, the heating body **4** presses the upper surface **5***b* of the pressing plate **5** by the second air cylinder **3**. Therefore, in a state where the pre-connection wire **20**A is pressed by not only the pressing plate **5** but also the heating body **4**, the solder is melted (pressing and heating process).

[0105] The pair of overlapping wires and the molten solder is called a molten solder wire **20**B.

[0106] In this embodiment, the pressing plate **5** and the heating body **4** are separately lowed as shown in FIGS. **4**B and **4**C. However, they may also be simultaneously lowered.

[0107] Next, as shown in FIG. **4**D, the second rods **3**A and the heating body **4** are raised by the second air cylinder **3**. At this time, the pressing plate **5** stays on the holding base **7** and continuously presses the upper surface of the molten solder wire **20**B until the solder solidifies. In addition, by cooling the upper surface **5***b* of the pressing plate **5** using the air-cooling fan **6**, the temperature of the pressing plate **5** is reduced, and the solidification of the solder is accelerated. Since the connection portion of the wires is continuously pressed until the solder solidifies, excess solder does not partially remain in the connection portion, and a well-finished connection portion can be achieved.

[0108] The raised heating body **4** and the pressing plate **5** that stays on the holding base **7** are separated from each other at a sufficient distance at which radiant heat from the heating body **4** is not transferred to the pressing plate **5**.

[0109] When the pressing plate **5** is sufficiently cooled to a predetermined temperature, the molten solder of the molten solder wire **20**B solidifies (cooling process).

[0110] When the pressing plate **5** reaches a predetermined temperature or when a predetermined time has elapsed after cooling is started, the fan is stopped. Furthermore, as shown in FIG. **4**E, the first rods **2**A and the pressing plate **5** are raised by the first air cylinder **2**. Accordingly, the splice structure can be formed, and the splice structure is removed (removing process) to be applied to various products.

[0111] In addition, the heating body **4** of the wire splicing device **1** is held at a temperature at which the solder can be melted, and thus a subsequent wire connection operation can be immediately performed.

[0112] In addition, in the method for forming the second splice structure **21**, the first wire **11** and the second wire **12** are disposed in the wire accommodation groove **7***a* so that the end portion **11***a* of the first wire **11** and the end portion **12***a* of the second wire **12** face each other, and the solder **14** is disposed to straddle the first wire **11** and the second wire **12**. After the connection wire **13** is disposed on the solder **14**, the second splice structure **21** can be formed in the same order as the above-described connection order.

[0113] In the wire splicing device **1** of this embodiment, the connection portion of the wires is heated by the heating body **4** via the pressing plate **5** so as to melt the solder, the heating body **4** is thereafter separated from the pressing plate **5** (that is, separated from the wires) while an application of pressure by the pressing plate **5** is maintained, and heating the wires can be immediately stopped. Accordingly, the wires are not continuously heated until the heating body **4** has cooled, and the time required to solidify the solder is reduced. Therefore, the time needed to make the connection is reduced.

[0114] In addition, in a case where the wire splicing device **1** of this embodiment is used for the connection of superconducting wires, the deterioration of the superconducting wires can be suppressed by reducing the heating time. Furthermore, since the heating time is reduced, in a case where a protection layer made of silver or a silver alloy is provided on the outer periphery of the superconducting wire or in a case where the boundary portion between a silver layer and a solder layer is provided therein, the diffusion of the solder through the silver layer can be suppressed. Therefore, an increase in the electrical resistance of the silver layer can be limited.

[0115] In addition, in the wire splicing device **1** of this embodiment, heating the connection portion of the wires is started or stopped by allowing the heating body **4** to come in contact with or be separated from the pressing plate **5**. Therefore, the heating body **4** can be always held at a temperature at which the solder is melted. Therefore, in a case where a subsequent connection operation is consecutively performed, the heating body does not need to be re-heated, and the time it takes to increase the temperature of the heating body to a temperature at which the solder is melted can be reduced.

INDUSTRIAL APPLICABILITY

[0116] According to the embodiment, it is possible to provide a wire splicing device, a wire splicing method, and a method for manufacturing a splice structure which enable connection of wires that exhibit stable performance with high production efficiency.

DESCRIPTION OF REFERENCE NUMERAL

[0117] **1**: wire splicing device, **2**: first air cylinder (first driver), **2**A: first rod, **3**: second air cylinder (second driver), **3**A: second rod, **4**: heating body, **4***a*: lower surface, **5**: pressing plate, **5***a*: protrusion, **5***b*, **7***b*: upper surface, **6**: air-cooling fan, **7**: holding base, **7***a*: wire accommodation groove, **8**, **11**: first wire, **8***a*, **9***a*, **11***a*, **12***a*: end portion, **9**, **12**: second wire, **10**, **14**: solder, **13**: connection wire, **20**: first splice structure, **20**A: pre-connection wire, **20**B: molten